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ABSTRACT

The purpose of this study was to evaluate differences in learning among culturally disadvantaged fourth-grade children who listened to a series of twenty narrative passages. The effectiveness of eight treatment combinations was compared. A total of 195 subjects were randomly selected from fourteen fourth-grade classes in schools located in culturally disadvantaged areas of Nashiville, Tennessee. The experimental group and 72 subjects from six other classrooms served as the control group. The experimental subjects were randomly assigned to groups of four, with four groups per classroom. Each group was then assigned to one of the eight different treatment combinations--a single presentation of the story or a double presentation of the story at one of the word-per-minute (wpm) rates of 200, 265, 331, and 400. The results of this study essentially supported the prediction of highest absolute scores at the lowest high-speed rate (200 wpm). The peak level of efficiency was at the 265 wpm rate as predicted. This study provides further evidence that high-speed listening can be an efficient learning medium for elementary school children. (TS)

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Differences in Learning Through Compressed Speech as a Function of Presentation Strategy and Rate Among Culturally Disadvantaged Fourth Grade Children[1]

by

Richard W. Woodcock and Charlotte R. Clark

Only during the past two decades has research begun to focus on the problems and advantages related to learning through listening. Taylor (1964) reports that 90 percent of the investigations on listening have been conducted since 1952. The findings of such research have helped stimulate the widespread use of audio-visual learning materials.

One aspect of listening research has been concerned with the use of rate controlled recordings as a learning medium, and has demonstrated that both time-compressed and time-expanded speech have potential usefulness in the school learning situation. Foulke, et al. (1962), found that compressed speech with rates up to 275 words per minute (wpm) was an excellent learning medium for the blind. This is in contrast to the normal speech rate of about 175 wpm and braille reading rates on the order of 90 wpm.

Woodcock and Clark (1968a) found that third, fifth, and sixth grade children were more efficient in learning at the compressed rates of 228 to 328 wpm, but the expanded rates of 78 and 128 wpm yielded the highest scores on comprehension tests. Thus, expanded rates may be more useful when studying is for the purpose of learning the most from a passage and time is not restricted, while compressed rates may be more useful when the goal is maximum learning per unit of time spent in listening.

With the recognition of the potential utility of expanded and compressed speech in educational settings comes the need to consider the conditions under which learning becomes optimal. Various strategies for presenting rate controlled listening materials were studied by Woodcock and Clark (1968b) using narrative materials with fifth grade children of average intelligence. Three presentation strategies--a single presentation, a double presentation, and a double presentation with a one-week interval between the two presentations--were compared. They found no significant differences among the three strategies. The study, however, was of short duration. A study of this nature conducted over several weeks might reveal differences in presentation strategy as a result of extended practice.

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The existing background of research with expanded and compressed speech suggests the value of a study which explores the effects of an extended series of lessons incorporated into the daily instructional program of the class and used over a period of several weeks. Such a study would provide needed information on the effects of this learning medium in a practical school learning situation.

Purpose

The purpose of this study was to evaluate differences in learning among culturally disadvantaged fourth grade children who listened to a series of 20 narrative passages. The effectiveness of eight treatment combinations was compared. The 20 passages were presented at four rates of compression (200, 265, 331, and 400 wpm) in conjunction with two presentation strategies--a single presentation of the passage followed by the test, or a double presentation of the passage followed by the test. Figure 1 illustrates the design of this study.

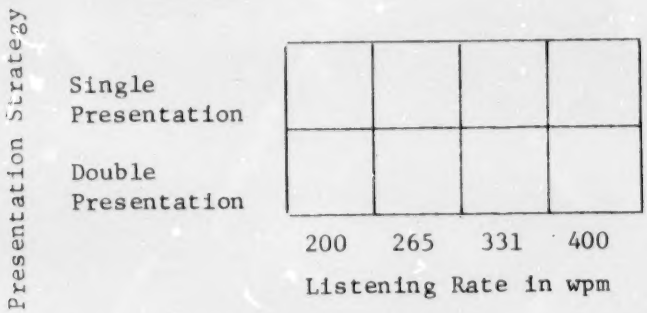

Fig. 1. The eight treatment combinations in this study.

On the two criterion measures, immediate retention, and delayed retention, it was predicted that the absolute scores on both would be highest at the lowest presentation rate used in this study. It was predicted further, that double presentation scores would be higher than single presentation scores. On the delayed retention measure, it was predicted that learning efficiency would be highest at the 265 wpm rate. No interaction between presentation strategy and rate of presentation was predicted.

Method

Subjects

One hundred ninety-five subjects were randomly selected from 14 fourth grade classes in schools located in culturally disadvantaged areas of Nashville, Tennessee. One hundred twenty-three subjects from eight classrooms comprised the experimental group and 72 subjects from six other classrooms served as the control group. The experimental subjects were randomly assigned into groups of four, with four groups per classroom. Each group was then assigned to one of the eight different treatment

combinations--a single presentation (S) of the story, or a double presentation (D) of the story at one of the word-per-minute rates of 200, 265, 331, and 400. The control group did not participate in the daily listening sessions. None of the subjects had previous experience with compressed speech.

Materials

The materials used in this study consisted of 20 narrative passages with a set of 35 to 40 correlated color slides. A 12 item multiple-choice test was developed for use with each passage. In addition, a comprehensive 80 item multiple-choice test covering all 20 passages was developed. The 20 passages concerned the lives of various Negroes and their contributions to American heritage.

Each passage was between 2700 and 4100 words long and was recorded at a base rate of approximately 200 wpm. Passage specifications are presented in Table 1. The reading grade level of each story was approximately 4.5 as measured by the Dale-Chall readability formula (Dale & Chall, 1948). Correlated 35 mm slides were made from original paintings and were changed approximately every 100 to 150 words throughout the presentation of each story.

Each taped presentation included:

1. Instructions to the subject regarding the earphones and adjustment of volume to each ear.

2. Instructions regarding the listening task to be presented.

3. The recorded passage with periodic "beep" signals which automatically advanced the slides.

4. Instructions to the subject for taking the test.

5. The multiple choice test over the contents of the passage. (The sum of the scores obtained on the 20 passages tests was used as the immediate retention measure in this study.)

Apparatus

Equipment was planned and designed so that the presentation of materials would be as automatic as possible. Each experimental classroom was assigned a Wollensak magnetic tape recorder (Model T1500), a Kodak Carousel slide projector (Model 650), a junction box with individual volume controls for each ear, four sets of foam-rubber-padded high impedence stereo earphones and a "beep" box plugged into the tape recorder and the projector to control the automatic advancing of slides. Equipment remained on a movable table and was situated in a listening-viewing area set up in each classroom.

Table 1

Passage Specifications

Passage	Number of Words	Original Recording Time	WPM Rate at Each Level of Compression .00	.25	.40	.50
Benjamin Banneker	3342	17'13"	194	259	323	388
James Beckwourth	4100	20'20"	202	269	337	404
Mary McLeod Bethune	3390	18'11"	186	248	310	372
Ralph Bunche	3944	19'47"	199	265	332	398
Paul Cuffe	3404	16'46"	203	271	338	406
Katherine Dunham	3347	17'15"	194	259	323	388
Estevanico	3656	19'12"	190	253	317	380
William C. Handy	3376	16'15"	208	277	347	416
Roland Hayes	3361	16'01"	210	280	350	420
Matthew Henson	3649	17'58"	203	271	338	406
Langston Hughes	3007	14'52"	202	269	337	404
Martin Luther King	4052	19'38"	206	275	343	412
Nat Love	3488	18'08"	192	256	320	384
J. B. Olinger	2730	14'32"	188	251	313	376
Jesse Owens	3790	19'20"	196	261	327	392
Bill "Bojangles" Robinson	3211	16'00"	201	268	335	402
Jackie Robinson	4043	20'41"	195	260	325	390
Harriet Tubman	3955	20'41"	191	255	318	382
Sojourner Truth	3806	19'25"	196	261	327	392
Ethel Waters	3668	16'55"	217	289	362	434

Procedure

The sequence of steps in selecting subjects and conducting the experimental sessions was as follows:

1. Sixteen subjects from each classroom were randomly selected from rosters provided by each experimental teacher.

2. These subjects were randomly assigned to one of the treatment groups. In four of the classrooms the treatment combinations included 200-D, 265-S, 331-D, and 400-S; in the other four, they included 200-S, 265-D, 331-S, and 400-D.

3. Teachers administered one passage per day to each of their four groups, four days a week for five weeks. The fifth day of each week was used for make-ups and for redistribution of materials. Subjects sat at a table in the "listening-viewing" area of their rooms. The teacher put the tape on the recorder, the slide tray on the projector, and turned on the equipment. The children put on their earphones and began the session. The teacher was not involved again until toward the end of the listening session. At this time she distributed the tests and then collected them when the tape was finished.

4. Each Friday packages of tapes, tests, and slide trays were collected and redistributed to other teachers. Tests were scored by the experimenters.

5. At the end of the five week period, subjects were administered, via tape, a four-alternative, 80 item multiple-choice test over the contents of the 20 passages. The score on this test was used as the delayed retention measure in this study.

6. A "learning efficiency index" derived from the delayed retention measure was calculated for each subject by the following formula:

$$\text{Learning Efficiency} = \frac{\text{Delayed Retention Score} - \text{Control Group Delayed Retention Mean}}{1.00 - \text{Level of Compression}}$$

7. Control subjects neither listened to passages nor took the daily tests. They were, however, administered the 80 item comprehensive test during the same week as the experimental subjects.

Results

Table 2 presents the mean immediate retention scores for each of the eight treatment groups. Figure 2 graphically portrays these same data. These data were analyzed by a two-way analysis of variance. A significant difference attributable to rate ($p < .001$) was obtained. There was no significant difference, however, between the presentation strategies nor was there a significant interaction between rate and presentation strategy. Table 3 presents the results of this analysis.

Table 4 presents the mean delayed retention scores for each of the eight treatment groups. Figure 3 graphically portrays these same data. These data were analyzed by a two-way analysis of variance. A significant difference attributable to rate ($p < .01$) was obtained. There was no significant difference between the presentation strategies nor was there a significant interaction between rate and presentation strategy. Table 5 presents the results of this analysis. (The mean score for the test-only control group was 23.6 on the delayed retention test.)

Table 6 presents the mean learning efficiency indexes based upon the delayed retention measure for each subject. Figure 4 graphically portrays the delayed retention efficiency data. Table 7 presents the results of a two-way analysis of variance of the efficiency indexes. There was a significant difference between presentation strategies ($p < .001$) but no significant difference among rates. No interaction effect between rate and presentation strategy was indicated.

Discussion

The results of this study essentially supported the predictions. The prediction of highest absolute scores at the lowest rate (200 wpm) was true with one exception--delayed retention scores were highest at 331 wpm rate in the double presentation strategy.

There was an incongruous dip in scores of the double presentation groups on both criterion measures at the 265 wpm rate. With this exception, the double presentation strategy produced higher mean scores throughout than did the single presentation strategy. The single presentation strategy, however, was the more efficient based upon the learning efficiency data. The peak level of efficiency was at the 265 wpm rate as predicted.

This study has provided further evidence that high-speed listening can be an efficient learning medium for elementary school children. The combination of listening and viewing correlated slides held the interest and attention of the pupils throughout the five week period. The self-contained nature of the materials and the "listening-viewing centers" provide the teacher with an easily handled instructional situation. Finally, the Negro heritage content of the experimental lessons helped fill a need in the school curriculum and was well received by teachers and parents, as well as the pupils.

Table 2

Mean Immediate Retention Scores by Rate and Presentation Strategy

Average Rate in wpm	Single Presentation		Double Presentation	
	n	$\bar{X}$	n	$\bar{X}$
200	14	172.7	15	177.8
265	15	166.2	17	154.5
331	14	133.5	18	168.3
402	16	119.3	14	127.4
Total	59	147.3	64	157.9

Table 3

Analysis of Variance: Immediate Retention Mean Scores

Source	df	MS	F	p
Rate (A)	3	13992.07	10.66	<.001
Presentation Strategy (B)	1	2525.41	1.92	N.S.
AB	3	2918.47	2.22	N.S.
Error	115	1312.94		

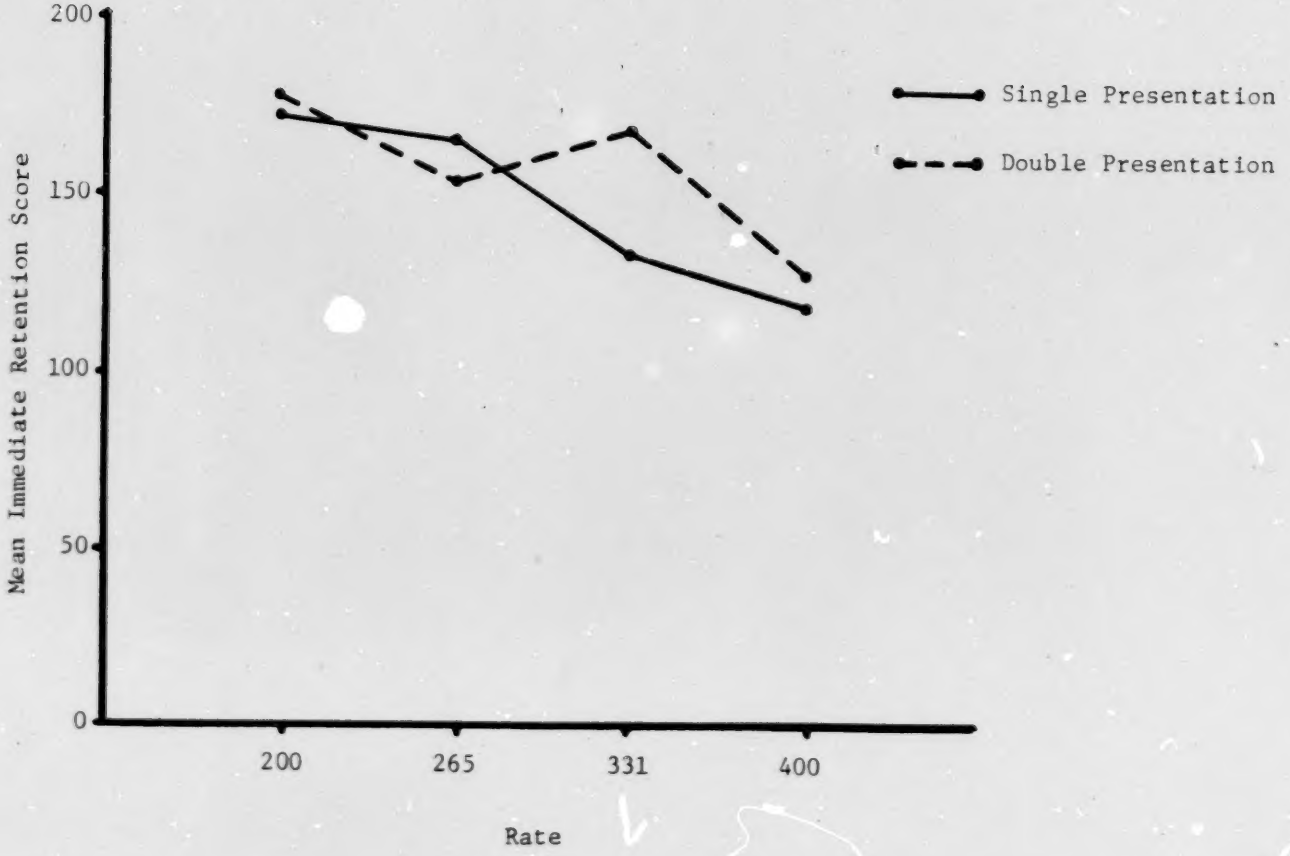

Fig. 2. Mean immediate retention scores by rate and presentation strategy.

Table 4

Mean Delayed Retention Scores by Rate and Presentation Strategy

Average Rate in wpm	Single Presentation		Double Presentation	
	n	$\bar{X}$	n	$\bar{X}$
200	14	52.4	15	52.5
265	15	51.5	17	45.5
331	14	44.2	18	53.4
400	16	36.6	14	39.3
Total	59	45.9	64	48.2

Table 5

Analysis of Variance: Delayed Retention Mean Scores

Source	df	MS	F	p
Rate (A)	3	1186.00	5.73	<.01
Presentation Strategy (B)	1	69.21	0.33	N.S.
AB	3	316.74	1.53	N.S.
Error	115	206.93		

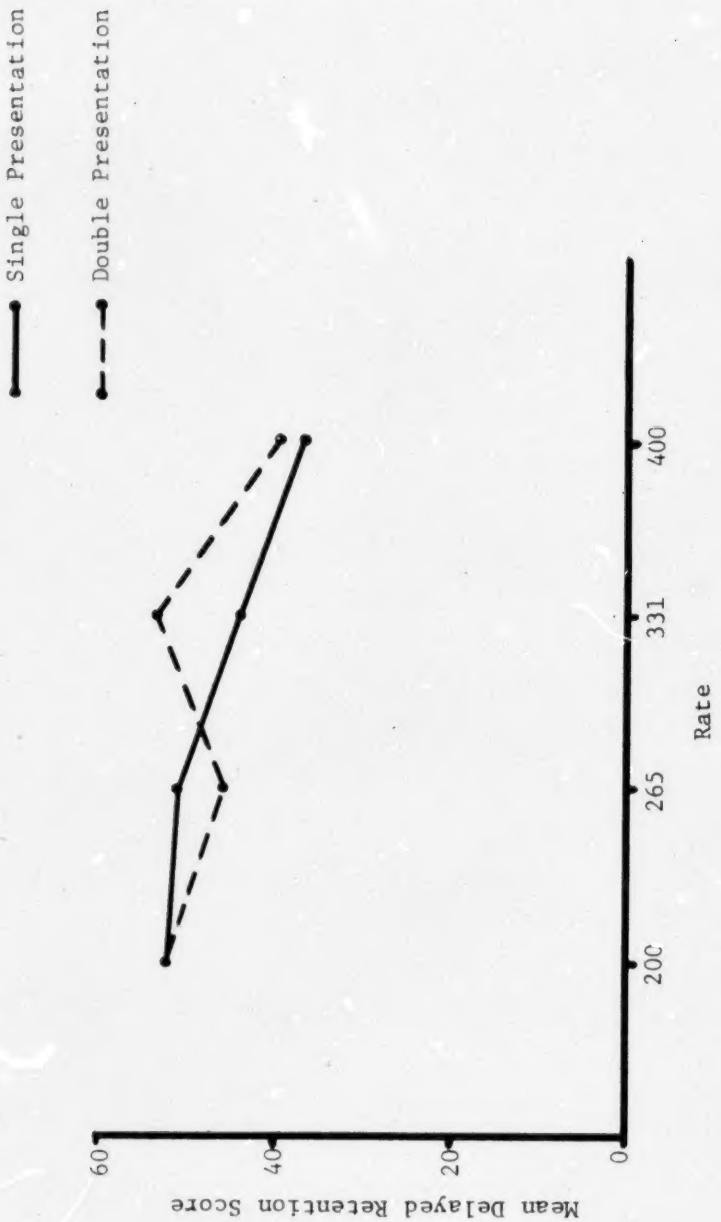

Fig. 3. Mean delayed retention scores by rate and presentation strategy.

Table 6

Mean Learning Efficiency Indexes by Presentation Strategy and Rate

Average Rate in wpm	Single Presentation		Double Presentation	
	n	$\bar{X}$	n	$\bar{X}$
200	14	28.7	15	14.5
265	15	36.1	17	14.6
331	14	33.1	18	24.8
400	16	25.9	14	15.8
Total	59	30.9	64	17.7

Table 7

Analysis of Variance: Learning Efficiency Indexes

Source	df	MS	F	p
Rate (A)	3	470.212	1.522	N.S.
Presentation Strategy	1	5636.841	18.245	<.001
AB	3	274.172	0.887	N.S.
Error	115	308.950		

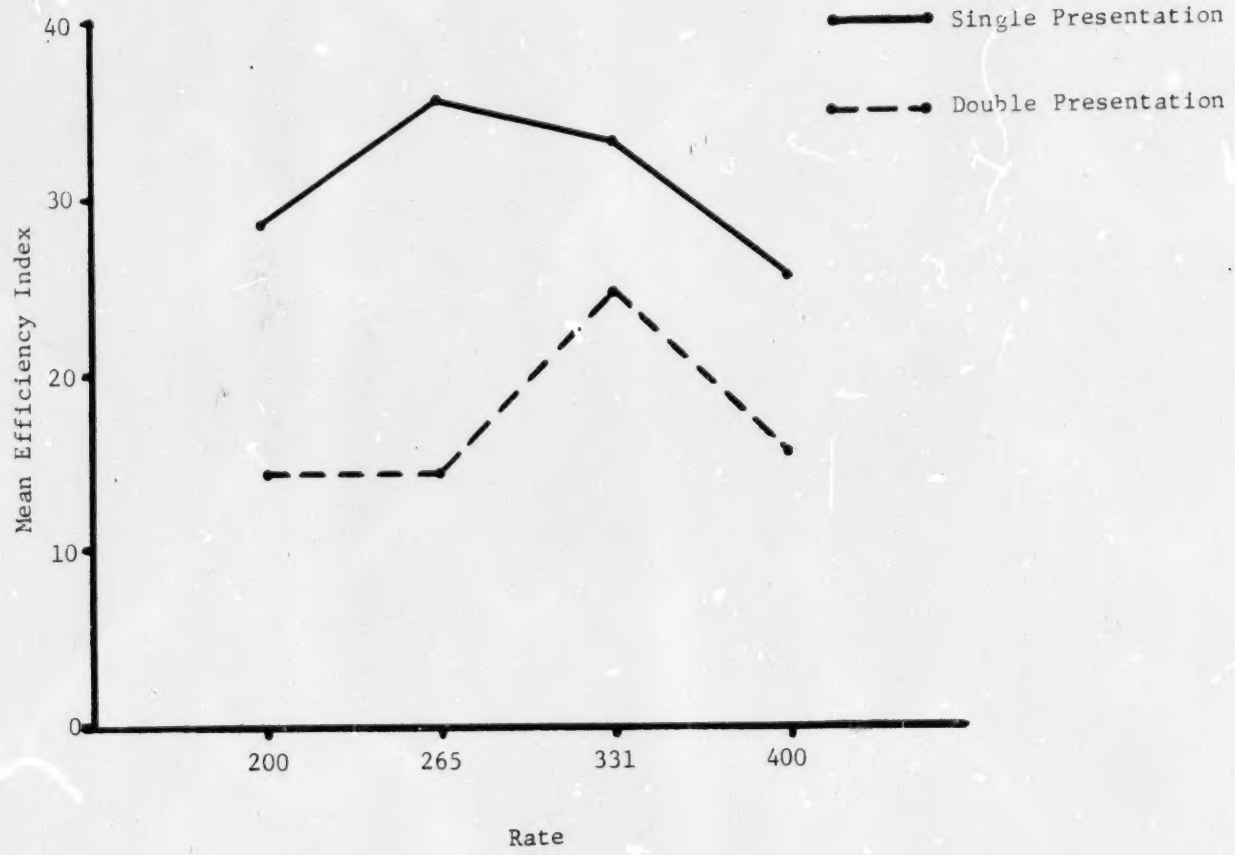

Fig. 4. Mean learning efficiency indexes by presentation strategy and rate.

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